

**TWO PARASITOIDS OF THE LILY BEETLE,
LILIOCERIS LILII (SCOPOLI) (COLEOPTERA:
CHRYSOMELIDAE), IN BRITAIN, INCLUDING THE FIRST
RECORD OF *LEMOPHAGUS ERRABUNDUS* GRAVENHORST
(HYMENOPTERA: ICHNEUMONIDAE)**

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Between 1996 and 1998 four hymenopteran parasitoids that attack the larvae of Lily beetle *Lilioceris lili* (Scopoli) were identified in mainland Europe (the ichneumonids *Lemophagus errabundus* Gravenhorst, *L. pulcher* (Szepligeti), *Diaparsis jucunda* (Holmgren) and the eulophid *Tetrastichus setifer* Thomson; Gold *et al.*, 2001). Only one of these parasitoids has previously been reported as present in Britain; *T. setifer* from a garden in Grays, Essex (TQ612793); (Cox, 2001). A search for *L. lili* parasitoids was made at the Royal Horticultural Society's Garden, Wisley, Surrey (TQ0658) during the spring and summer of 2000. A total of 393 *L. lili* larvae were collected from the Garden and reared singly in ventilated glass tubes (75 mm × 25 mm), filled to 25 mm with a 1:1 coarse sand and peat mix; leaves of *Lilium regale* Wilson were provided as a food source, replenished as necessary. A further 50 *L. lili* larvae were received from other localities (*via* the RHS members' advisory service); these were also reared singly. Beetle larvae that died were dissected to establish if parasitoid larvae were present.

All of the hymenopteran parasitoids of the lily beetle larvae found in Europe overwinter in their host's pupal chambers (Gold *et al.*, 2001), thus tubes from which an adult *L. lili* had not emerged by the end of October 2000 were overwintered at 4–6°C for six months. The tubes were brought up to room temperature (22.5°C) in April 2001, and after four weeks two species of parasitoid had emerged. These were tentatively identified as *Tetrastichus setifer* and *Lemophagus errabundus*. The identity of the latter has been confirmed by M. Kenis (CAB International Bioscience, Switzerland), and this is the first time this species has been identified from Britain. The identity of *T. setifer* was confirmed by comparison with specimens supplied by M. Cox. Pupal cells from which no parasitoids emerged were dissected to see if there were any indications of parasitism. Specimens of *L. errabundus* have been deposited in the National Museums of Scotland, Edinburgh and specimens of both species of parasitoid are deposited in the collections at RHS at Wisley Garden.

Tetrastichus setifer adults emerged from *L. lili* larvae received in June 2000 from Surrey (Surbiton, TQ16 and Normandy, SU95) and E. Sussex (Rye, TQ92). Although no adults of this species emerged from *L. lili* larvae collected from Wisley Garden, 15 (4%) of the larvae collected from there were found to be infested with this parasitoid upon dissection of the host larvae or pupal cells. *Tetrastichus setifer* is a gregarious species, a mean of seven adults emerged from each host (range 4 to 11, $n=5$) although it is known that this range can be wider (2–17, mean 8.8; Gold *et al.*, 2001). The larvae are hymenopteriform: spindle-shaped and maggot-like, with whitish translucent skin; the head is reduced and barely discernible. This species overwinters as larvae in the host's cocoon before pupating in the spring (Gold *et al.*, 2001). The adult parasitoids are 2–3 mm long and metallic blue black, the coxae and femora are black with paler knees, the tibiae and tarsi are yellow-brown, the last tarsal segment is darker.

One female and two male *L. errabundus* adults emerged from *L. lili* larvae collected from Wisley Garden. Dissection of host larvae that died or pupal cells indicated that 90 (23%) of the 393 *L. lili* larvae collected had been attacked by this ichneumonid. The translucent white first instar larvae of *L. errabundus* are typical mandibulate form, with obvious segmentation and a large head; subsequent larval instars were not observed. This species overwinters in cocoons within the host's pupal cells (Gold *et al.*, 2001). Dissection of five *L. lili* larvae indicated that *L. errabundus* can be gregarious with up to nine larvae present in one *L. lili* larva, however only one adult ichneumonid emerges from each host (Gold *et al.*, 2001 describe this species as solitary). The adult of this species is 6–7 mm long, the abdomen is primarily orange-brown with the first segment black. The anterior legs are brown with black coxae and trochanters, the second and third pair of legs are orange-brown. The head, antennae and thorax are black. Wing venation and stigma are brown and well marked.

M. Cox (pers. obs.) found ichneumonid parasitoids in *L. lili* larvae collected from his garden in Grays, Essex, in 1998. None of these successfully emerged as adults; examination of some specimens remains and subsequent successful rearing of *L. errabundus* in 2000 indicated that these were also *L. errabundus*. Of 51 larvae collected between May and July 1999, 67% were infested with *L. errabundus* (M. Cox pers. obs.).

Both species of *L. lili* parasitoid so far encountered in Britain are thought to be specific to the genus *Lilioceris* (Gold *et al.*, 2001; M. Kenis pers. com.). As the Lily beetle is an established alien pest (Fox Wilson, 1942; Cox, 2001), and the only species of *Lilioceris* found in Britain, it can be assumed that these two species of parasitoid are also established aliens. Emphasis is currently being placed on *T. setifer* as a potential biocontrol agent for the Lily beetle in Massachusetts, USA, where *L. lili* became established in 1992 (Gold *et al.*, 2001). Investigations into the biology and distribution of the parasitoids in Britain are continuing at Wisley Garden.

Thanks are due to Marc Kenis and Mike Cox for providing observations and commenting on earlier versions of the manuscript. Andrew Halstead for his advice and Ian Waghorn for his assistance in gathering data.

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